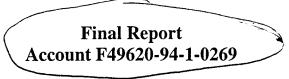
REPORT	DOCUMENTATION PAGE			
		esponse i AFRL-SR-E	3L-TR-00-	a sources,
gathering and maintaining the data needed, and completing and reviewing the collection of information collection of information, including suggestions for reducing this burden, to Washington Headquarters (Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget,			177	ect of this Jefferson 3.
1. AGENCY USE ONLY (Leave blank	1	3. R	07/01/94 - 09/30/98	
4. TITLE AND SUBTITLE	June 2000		5. FUNDING NUMBERS	
UNSTEADY HEAT TRANSFER WRIGHT LABS	ON THE TURBINE RESEAR		F49620-94-1-0269	
6. AUTHOR(S) John E. LaGraff				
7. PERFORMING ORGANIZATION NDEPARTMENT OF MECHANIC ENGINEERING Syracuse University Syracuse, New York 13244		ANUFACTURING	8. PERFORMING ORGANI REPORT NUMBER	ZATION
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITORING	
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH			AGENCY REPORT NU	MBER
801 N. Randolph St.			AFOSR	
Arlington VA 22203)A			
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT			12b. DISTRIBUTION CODE	
				,
UNLIMITED				
13. ABSTRACT (Maximum 200 word	ds)		•	
Steady-state and time resolved her turbine. The tests were conducted Laboratories in Dayton, Ohio. The Oxford University Osney Turbom in addition to the present test blad data, and other techniques to mean technical results have been reported.	at transfer rates were measured in the blow-down (transient) he heat transfer instrumentation tachinary Laboratory. Tests we le allowing comparisons to be a sure heat transfer. Ultimately,	Furbine Research Facilians was designed, fabricate conducted in the TR made with steady and u comparisons with pred	ity (TRF) at the USAF Weed, and installed on the tear. We with an array of instruments as teady measurements, as	right est vane at the mental blades crodynamic
		2000	00929 04	.3
14. SUBJECT TERMS			15. NUMBER OF	PAGES
UNSTEADY HEAT TRANSFER ON THE TURBINE RESEARCH FACILITY AT			WRIGHT 16. PRICE CODE	
LABS.			To. Thick cobe	
17. SECURITY CLASSIFICATION 1 OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIF OF ABSTRACT	TICATION 20. LIMITATION	OF ABSTRACT

UU



U.S. Air Force Office of Scientific Research AASERT Supplement Grant

[Parent Proposal USAFOSR F49620-92-J-0079 Turbulent Spot Generation and Growth Rates in a Compressible Boundary Layer]

Title of AASERT Grant: Unsteady Heat Transfer on the Turbine

Research Facility at Wright Labs

Dates: of AASERT Grant: 1 July 1994 – 30 September 1998

Amount of Grant: \$121,139

Principal Investigator: John E. LaGraff

Department of Mechanical, Aerospace, and

Manufacturing Engineering

Syracuse University

Syracuse, New York 13244

(315) 443-1189

Abstract

Steady-state and time resolved heat transfer rates were measured on a first stage vane of a modern high pressure aircraft turbine. The tests were conducted in the blowdown (transient) Turbine Research Facility (TRF) at the USAF Wright Laboratories in Dayton, Ohio. The heat transfer instrumentation was designed, fabricated, and installed on the test vane at the Oxford University Osney Turbomachinary Laboratory. Tests were conducted in the TRF with an array of instrumental blades in addition to the present test blade allowing comparisons to be made with steady and unsteady measurements, aerodynamic data, and other techniques to measure heat transfer. Ultimately, comparisons with prediction techniques were made. Full technical results have been reported in the literature (Refs. 1, 2).

Introduction

The AASERT Program was designed as a supplemental grant to an existing USAFOSR grant that would support an additional graduate student to conduct a specific research project closely related to the original grant. The funding was to cover only the cost of supporting this student. The parent proposal included developing a new type of sputtered thin film gauge to be used in the detection and tracking of high-frequency unsteadiness associated with transitional boundary layers. These thin film gauges had the ability to measure absolute surface heat transfer levels on complex surfaces at wide bandwidths. The AASERT proposal made by the principal investigator was to instrument a real vane on a stage of a modern high-pressure turbine being proposed for testing in the recently commissioned Turbine Research Facility (TRF) at Wright Laboratories.

The AASERT Student spent two periods of residence at Oxford to learn the new techniques and oversee the instrumentation of the vane. He also spent an extended period of time at Wright Labs to learn the operation of the TRF and relevant instrumentation and data acquisition systems. He also, of course, completed his residency requirements for the Syracuse University M.S. degree and successfully defended his thesis in June 1997.

Results

Full technical results of this project are described in the M.S. thesis of Christopher Joe, the AASERT student supported by this grant (Ref. 1). A technical paper was also produced which relates this work to other measurements and predictions conducted for the TRF project (Ref. 2).

Student Supported

Christopher Joe - BSAE 1995, Syracuse University

MSAE 1997, Syracuse University

Thesis Title: Unsteady Heat Transfer on the Turbine Research

Facility at Wright Laboratory

Transitions to Industry

The supported student, Christopher Joe, was offered a job by Pratt & Whitney Engine Company before he had finished his thesis. The company, whose engine was being tested as part of the test in the TRF, was interested in the experimental technique and knowledge of the subject of turbine heat transfer that Christopher had developed and subsequently offered him a position with their company. The technical publication (Ref. 2) including this research was published as part of the findings of a larger Pratt & Whitney/USAF program.

References

- 1 Joe, C. R., "Unsteady Heat Transfer on the Turbine Research Facility at Wright Laboratory," M.S. Thesis, Syracuse University, 1997.
- 2 Joe, C. R., Montesdeoca, X.A., Soechting, F. O., MacArthur, C. D., and Meininger, M., "High Pressure Turbine Vane Annular Cascade Heat Flux and Aerodynamic Measurements with Comparison to Predictions," ASME Paper 98-GT-430, 1998.